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AUTHOR Quigley, Stephen P.; Sarff, Lewis S.
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ABSTRACT

The paper provides information on two research projects: one to determine the extent to which mild to profound levels of hearing impairment are related to language performance, and the other to investigate the effects of two types of programs (teacher voice amplification and resource room instruction) on the educational functioning of elementary level hearing impaired students. Noted among findings are that even mild degrees of hearing impairment might produce some negative educational effects; that hearing impaired groups perform at lower levels on all language tests than the normal hearing comparison group; and that there is a possibility that mild hearing impairment is associated with academic retardation and that the effect is cumulative. (SBH)

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The Forgotten Child: The Needs of Hard of Hearing Children

84. Paper I
#4

Language and Hearing Impairment: A Research Perspective

Stephen P. Quigley
University of Illinois, Urbana-Champaign, Illinois, U.S.A.

Lewis S. Sarff
Wabash and Ohio Valley Special Education District
Norris City, Illinois, U.S.A.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Between October 1975 and March 1976, the University of Minnesota in cooperation with the United States Bureau of Education for the Handicapped conducted a series of meetings at which specialists discussed the effects of hearing impairment upon communication, language, and educational development. From those meetings a report was edited by Dr. Julia Davis of the University of Iowa titled, Our Forgotten Children: Hard-of-Hearing Pupils in the Schools. This report served to emphasize and focus the concern expressed by a number of investigators during the past decade that hearing impaired children other than those who are profoundly deaf have been relatively neglected in our educational system. The title of the report edited by Dr. Davis so aptly describes the plight of the hard-of-hearing pupil that we sought and received permission to use it for this session of the World Congress on Future Special Education.

There is a large population of hearing impaired children in schools in the United States whose needs are apparently not being met by the services now provided. If a child has hearing impairment of sufficient severity to be considered "deaf", there are usually special and extensive services available for his education. But if the child is hard-of-hearing, and especially if the impairment is mild or moderate, then appropriate services are less likely to be provided. The identification and treatment of these children could well be one of the most neglected problems in our schools. This certainly qualifies the problem as a major concern for future special education.

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In this presentation, we will provide brief information on two research projects being conducted in the state of Illinois. The first project is a research study which seeks to determine the extent to which levels of hearing impairment from mild to profound are related to language performance. The other project is investigating the effects of two types of programs on the educational functioning of students with mild or moderate impairments of hearing.

Deviancies in speech production and speech perception have been documented in hard-of-hearing children by a number of investigators, and the effects of hearing impairment on language and academic performance have also been noted by researchers for more than 30 years. Table 1 presents some results from Quigley and Thomure (1968) which are representative of the findings of other studies. The table shows the differences between expected grade performance and actual grade performance for the subjects on several subtests of the Stanford Achievement Test. Only the Word Meaning, Paragraph Meaning, and Language Subtests were administered because the major interest was in the effects of hearing impairment on language performance.

Two things may be readily noted from study of Table 1. First, for every subtest in every hearing level category actual performance was lower than expected performance. Second, there was a steady progression in retardation on each subtest through the various hearing threshold categories with the exception of the last category where only the Language subtest maintained the progression. The mean difference score for the average of the subtests was 1.25 grades. The expected grade placement of the subjects was 6.90 and the actual grade placement was 5.78 for a difference of 1.12. Thus, the retardation in grade placement was very similar to the retardation in test performance.

Of particular interest in Table 1 is the educational retardation in the first two categories of hearing threshold level (less than 15dB and 15 to 26 dB). These

Table 1

Differences Between Expected Performance and Actual Performance of the Subjects on Various Subtests of the Stanford Achievement Test

Hearing Threshold Level (Better Ear)	N	IQ	Word Meaning	Paragraph Meaning	Language	Subtest Average
Less than 15 dB	59	105.14	-1.04	-0.47	-0.78	-0.73
15-26 dB	37	100.81	-1.40	-0.86	-1.16	-1.11
27-40 dB	6	103.50	-3.48	-1.78	-1.95	-2.31
41-55 dB	9	97.89	-3.84	-2.54	-2.93	-3.08
56-70 dB	5	92.40	-2.78	-2.20	-3.52	-2.87
Total Group	116	102.56	-1.66	-0.90	-1.30	-1.25

Expected Grade Placement in School (N=116)M, 6.90; sd, 2.63.
Actual Grade Placement in School (N=116)M, 5.78; sd, 2.61.

NOTE: From "The Relationship of Hearing to Learning" by Stephen P. Quigley and F. Eugene Thomure, Division of Special Education Services, Springfield, Illinois, 1968.

data indicate that even very mild degrees of hearing impairment might produce some negative educational effects. Ross (1977) has pointed out that this finding of Quigley and Thomure was corroborated by Holm and Kunze (1969) and Ling (1972).

In order to examine in more detail the type and extent of the relationship between language and hearing impairment we have initiated a research project with the design shown in Table 2. It can be seen that there are six Hearing Threshold Levels and three age levels. Within each cell are 20 subjects, 10 male and 10 female. The plan was to administer the Test of Syntactic Abilities, which measures the major syntactic structures of standard English, to the students and also collect data on educational achievement. Data collection is not yet complete and we can show only some partial results. Table 3 shows the results on the Test of Syntactic Abilities for the hearing impaired students in the 11-13 year old group.

First, it can be seen in Table 3 that all of the hearing impaired groups performed at lower levels on all tests than the normal hearing comparison group. Second, the first three groups of hearing impaired subjects for whom data are presented have very similar scores on most of the tests. (Data have not yet been completely processed for the 27-40 dB group). Third, there is a sharp drop in scores between these groups and the fifth group, with the difference for the total test score being 12%. Fourth, there is a similar sharp drop of 13% between the fifth and sixth group.

Thus, though we used a widely accepted statistical classification of hearing impairment in setting the six Hearing Threshold Levels, we found that there were only three functional levels insofar as language performance on the TSA was concerned.

It is interesting to note that the three groupings correspond to what have traditionally been termed hard-of-hearing (up to 70 dB), severely hearing impaired

Table 2. Age and degree of hearing impairment of subjects included in the sample.

	ages 8 through 10 years	ages 11 through 13 years	ages 14 through 16 years	
0-26 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
27-40 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
41-55 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
56-70 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
71-90 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
greater than 90 dB ANSI	10 males 10 females	10 males 10 females	10 males 10 females	total=60
	total=120	total=120	total=120	

TOTAL (ENTIRE SAMPLE) = 360 SUBJECTS

Table 3

Comparative Performance of Normal Hearing and Hearing Impaired Students on Nine Major Syntactic Structures of English (Per Cent Correct)

Hearing Threshold Level[a]	Neg	Conj	Det	QF	Verbs	Pron	Rel	Comp	Nominal	All Structures
Normal Hearing, CA 10.00 Years										
Normal	99	83	89	93	84	79	79	83	——	84
Hearing Impaired, CA, 12.00 Years										
15 - 26 dB	92	73	81	81	70	67	65	59	56	73
27 - 40 dB	—	—	—	—	—	—	—	—	—	—
41 - 55 dB	94	71	70	80	71	68	59	62	60	70
56 - 70 dB	95	82	74	82	72	71	61	68	61	73
71 - 90 dB	85	67	66	66	61	63	49	52	56	61
90 + dB	68	52	55	51	50	47	39	40	45	48

[a]Better ear average at 500, 1000, and 2000 hz (ISO).

(71-90 dB), and profoundly hearing impaired, or deaf (90 dB+). This is one of the goals of the project: to determine educationally meaningful categories of hearing impairment that can be used for classifying hearing impaired children for educational services. We also hope to be able to specify the particular language problems that are associated with those levels, with special emphasis on the first four levels, which in our data formed a single functional group, and which are considered to be mild and moderate levels of hearing impairment.

The second project we are conducting is investigating the effects of two types of educational services on the educational functioning of students with mild or moderate hearing impairments. Mild to moderate hearing impairment is defined as a Pure Tone Average between 10 and 40 dB for the speech frequencies of 500, 1000, and 2000 Hz. The MARRS (Mainstream: Amplification Resource Room Study) Project which will operate from 1977 to 1980 will compare the effects of two instructional techniques, teacher voice amplification and small group (resource room) instruction, on the academic performance of 4th, 5th and 6th grade target students in three elementary schools located in Fairfield, Golconda and Norris City, Illinois. In each of the three schools there are approximately 10 students at each of the grade levels meeting the project criteria of mild to moderate hearing impairment, normal intellectual potential, and academic retardation of half a grade level or greater. Thus, there is a total of 90 target students who have lower than expected academic performance co-existing with mild to moderate hearing impairment.

In order to identify target students, a battery of tests consisting of the SRA educational achievement series, the Wide Range Achievement Test, the Otis-Lennon Mental Abilities Test, and the Self Esteem Inventory were administered to all 4th, 5th and 6th grade students in the three participating schools in addition to an audiological assessment. The project audiologist screened all of the students (N=602)

in the three schools at 10 dB and 15 dB at the frequencies of 250, 500, 1000, 2000, 4000, 6000, and 8000 Hz using appropriate audiological equipment. Where no response was obtained at 15 dB, a threshold was established using standard audiometric procedure. Those students whose pure tone average exceeded 10 dB and those who failed to respond on 6 of 14 frequencies at 10 dB who also were found to be achieving one half year or more below actual grade placement were considered as potential target students. Once identified from the combination of audiological, intellectual, and educational achievement data, target students were assigned randomly to one of the two treatment groups to provide 45 subjects for each treatment - five at each of the three grade levels in each of three schools.

Experimental Group I is designated as the Amplification group. In each of the three participating schools, one 4th, one 5th, and one 6th grade classroom was equipped with amplification equipment consisting of a special unidirectional FM microphone, a wireless transmitter, a wireless transmitter receiver, a 10 watt RMS power amplifier, and two 12" speakers specifically designed for the speech and audio range. Teachers wear a lightweight cordless microphone and use amplification when lecture and oral instructions are employed. The cordless microphone permits the teacher to move freely about the classroom while maintaining a constant signal 5 to 10 dB above the average ambient noise level in the room.

The 45 target students assigned to this treatment in the three schools have not been identified to the classroom teacher. Therefore, target students theoretically receive the same treatment as all other students in that classroom as instruction is amplified for target and non-target students alike and all are exposed to the potential benefits of amplification.

Experimental Group II is designated as the Resource Room group. Target students in this treatment attend the regular classroom and require no special materials, but have access to special help in individual or small group sessions from a certified

learning disabilities teacher, in areas of need as designated by the regular classroom teacher. Theoretically, small group instruction enhances the students ability to attend to the teacher's voice.

Thus, both experimental treatments are designed to compensate for mild hearing impairment while keeping the students in the mainstream (least restrictive environment) of the educational and social structure. The experimental design allows for comparison of the performance of the 90 target students with normative data on the SRA academic achievement tests and the Wide Range Achievement Test and with similar data on a control group. It also allows for comparison of the two treatment methods. It is hypothesized that either or both of the special treatments (teacher voice amplification and small group resource room) will lead to improved academic performance of the target population during the three years of the study. We are not hypothesizing that either of the two treatments will be superior to the other.

Table 4 shows screening data on students examined for the project and also illustrates the academic retardation often associated with mild hearing impairment. It can be seen that substantial, and approximately equal, percentages of students failed the hearing screening at 15 dB in each grade within each school, but there were some differences among schools. The second part of the Table displays the percentages of students failing the hearing screenings at 15 dB who also had academic deficiency of one half year or more. It is interesting to note the increase in these percentages by grade level for each school. In Golconda the percentage increased from 37.5 in 4th grade to 69.0 in 6th grade; in Norris City the corresponding percentages were 33.4 and 72.3; and in Fairfield they were 36.7 and 84.0. While these data must be interpreted very cautiously, they indicate the possibility that mild hearing impairment is associated with academic retardation and that the effect is cumulative.

Table 4

Percent of students failing the M.A.R.R.S. hearing screening at 15 dB .

	Golconda	Norris City	Fairfield
4th	45.3%	23.5%	39.0%
5th	45.0%	25.9%	20.4%
6th	42.6%	31.0%	26.9%
School Average:	44.3%	26.8%	28.8%

Percentages of students failing hearing screenings at 15dB and having academic deficiency of at least .5 year in one or more academic areas.

	Golconda	Norris City	Fairfield
4th	37.5%	33.4%	36.7%
5th	74.1%	30.8%	77.8%
6th	69.0%	72.3%	84.0%

It is anticipated that the M.A.R.R.S. project and the research by Quigley will contribute to a better understanding of: (1) the extent to which mild and moderate levels of hearing impairment contribute to educational problems in the general school population, and (2) the effects of treatment procedures which concentrate on keeping the hearing impaired child within the regular classroom. Mild to moderate hearing impairment is possibly the most prevalent of all disabling conditions in the school population. If it has significant effects on language and other aspects of educational development, then it is deserving of extensive research to understand those effects and serious development of innovative programs to eradicate the effects. Besides being possibly the most prevalent of disabling conditions in the school population, mild and moderate hearing impairment has certainly been the most neglected. Concentration on this area should be a major responsibility of future special education.

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